

1. (Currently Amended) Process for the production of thermoplastic vulcanizates, which comprises
  - (a) preparing a mixture of polymeric materials, including a matrix and a disperse phase component, and
  - (b) carrying out dynamic vulcanization of the disperse phase component, said dynamic vulcanization comprising the steps of:
    - b.1) grafting an organic silane on said disperse phase component, whereby to produce grafted disperse phase component chains; ; and
    - b.2) cross-linking said disperse phase component chains in the presence of a cross-linking agent comprising an acid; ;wherein the weight ratio of said cross-linking agent to said organic silane is from 1:3 to 1:1, and the duration of said cross linking is from a minute to half and hour; and wherein said grafting and said cross-linking being are carried out in the molten state of said disperse phase component, wherein said grafting and cross-linking do not require in the absence of water the addition of water into said mixture of polymeric materials.
2. (Original) Process according to claim 1, wherein the organic silane is an alkoxy silane.
3. (Previously presented) Process according to claim 1, wherein said cross-linking agent is selected from the group consisting of inorganic acid, organic sulfonic or carboxylic acid, anhydride of inorganic acid or anhydride of sulfonic or carboxylic organic acid, and polyfunctional compound having acid functionality in combination with an amine compound.
4. (Previously Presented) Process according to claim 3, wherein said cross-linking agent is selected from the group consisting of (i) boric acid and (ii) adipic acid with an amine.
5. (Original) Process according to claim 4, wherein the amine of the combinations of adipic acid and an amine is triisopropanol amine or triethanol amine.

6. (Original) Process according to claim 1, wherein the dynamic vulcanization is carried out in batch mode.
7. (Original) Process according to claim 1, wherein the dynamic vulcanization is carried out in continuous mode.
8. (Original) Process according to claim 1, wherein the matrix material is a semi-crystalline polymer.
9. (Original) Process according to claim 1, wherein the matrix material is an amorphous polymer.
10. (Original) Process according to claim 8, wherein the semi-crystalline polymer is chosen in the group consisting of thermoplastic polyesters, polyacetals, polyvinylidene fluoride (PVDF), polycarbonate, polystyrene and styrene copolymers, crystalline polyethylene, ethylene copolymers, polypropylene homopolymer, propylene-ethylene random copolymer, heterophasic propylene-ethylene copolymer, and polyamides.
11. (Original) Process according to claim 1, wherein the matrix polymer is in the amount of 15 to 80 wt% of the total polymeric composition.
12. (Original) Process according to claim 1, wherein the disperse phase component is chosen in the group consisting of polyethylene having density in the range  $0.90 - 0.96 \text{ g/cm}^3$ , ethylene- $\alpha$ -olefin copolymers having density in the range  $0.85 - 0.95 \text{ g/cm}^3$ , ethylene copolymers with vinyl acetate or acrylate or other polar monomers, chlorinated polyethylene, styrene block copolymers, natural rubber, polybutadiene, nitrile rubber, butadiene-styrene rubber, nitrile rubber, chloroprene rubbers, butyl rubber, hydrogenated rubbers, and blends thereof.
13. (Original) Process according to claim 1, wherein the disperse phase component is in the amount of 20 to 85 wt% of the total polymeric composition.

14. (Original) Process according to claim 1, wherein the cross-linking agent is in the amount of 0.05 to 5 parts per 100 parts of the total polymeric composition.
15. (Original) Process according to claim 1, further comprising adding to the thermoplastic vulcanizate, at any convenient stage of the preparation thereof, one or more additional components chosen from the group consisting of antioxidants, plasticizers, mineral fillers and functional components, and additional polymer components selected from crystalline or amorphous polymers, elastomers, and grafted polymers.
16. (Original) Process according to claim 1, wherein the matrix is not cross-linkable.
17. (Original) Process according to claim 1, wherein the disperse phase component has a melting point lower than the melting point of the matrix and the grafting is carried out at temperatures between the melting point of the matrix and the melting point of the disperse phase component.
18. (Original) Process according to claim 1, wherein the grafting is carried out at temperatures at which all the polymeric components are molten.
19. (Original) Process according to claim 1, further comprising removing any residues of the volatile components by venting or vacuum after the grafting stage has ended.
20. (Original) Process according to claim 6, wherein the grafting and the cross-linking are carried out successively.
21. (Original) Process according to claim 6, wherein the grafting and the cross-linking are carried out in different zones of the barrel of an extruder.

22. (Previously presented) Process according to claim 6, comprising the steps of:

- a) mixing the disperse phase component and at least part of the matrix with the chosen silane, free radicals, free radical generators and optionally tin-organic compounds;
- b) bringing the mixture of the aforesaid components to the grafting temperature;
- c) allowing the grafting to take place;
- d) after the grafting, raising the temperature of the mixture to at least the melting point of the matrix, and adding the cross-linking agent and antioxidant;
- e) allowing the cross-linking to occur, whereby phase inversion occurs;
- f) optionally, devolatilizing the resulting product;
- g) adding any required additional components, while mixing; and
- h) discharging the final product.

23. (Original) Process according to claim 7, comprising the steps of:

- a) feeding at least part of the matrix and all other polymeric components to the feed hopper of an extruder;
- b) feeding silane and peroxide to a feeding zone of the extruder, while cooling said zone;
- c) heating the grafting zone of the extruder to such a temperature as to melt the disperse phase component without melting the matrix;
- d) kneading the resulting mixture;
- e) feeding an additional feeder zone of the extruder the additives needed for causing cross-linking, including cross-linking agents and antioxidants;
- f) if necessary, completing the feeding of the matrix;
- g) mixing and kneading the mixture of the fed components, while heating;
- h) removing the volatiles;
- i) optionally adding extender oil and mixing; and
- k) extruding the resulting product.

24. (Currently Amended) Thermoplastic vulcanizates prepared according to the process of claim 1, comprising a matrix and a cross-linked disperse phase, which are thermodynamically incompatible, wherein said disperse

phase is at least 50% by volume and is characterized by a silane cross-linked density of at least  $5 \times 10^{-5}$  mol/cm<sup>3</sup> and high gel content; said vulcanizates having the following properties:

- a) low rigidity;
- b) ~~high~~ a flexibility measured characterized by low a Shore hardness between 25A and 60D;
- ~~e) disperse phase content of at least 50% by volume;~~
- ~~d) high gel content of the vulcanized disperse phase component;~~
- ~~e) high cross-link density of the vulcanized disperse phase component;~~
- f ~~c~~) white color;
- g ~~d~~) non-hygroscopicity;
- h ~~e~~) lack of toxic components; and
- i ~~f~~) narrow gaps (ligaments) between cross-linked disperse phase particles, providing near-continuity of said particles within the matrix.

25. (Currently Amended) Thermoplastic vulcanizates prepared in according to the process of claim 1, comprising a matrix and a cross-linked disperse phase, which are thermodynamically incompatible; ; wherein said disperse phase is at least 50% by volume and is characterized by a silane cross-linked density of at least  $5 \times 10^{-5}$  mol/cm<sup>3</sup> and high gel content; said vulcanizates having the following properties:

- a) low or medium rigidity;
- ~~b) disperse phase content of at least 50% by volume;~~
- ~~e) high gel content of the vulcanized disperse phase component;~~
- ~~d) high cross-link density of the vulcanized disperse phase component of more than  $5 \times 10^{-5}$  mol/cm<sup>3</sup>;~~
- e ~~b~~) white color;
- f ~~c~~) non-hygroscopicity;
- g ~~d~~) lack of toxic components;
- h ~~e~~) excellent processability by techniques used for processing thermoplastics, comprising extrusion, molding, thermoforming, blow molding, calendering;
- i ~~f~~) very good impact resistance at room temperature and below 0°C; and
- k ~~g~~) high melt elasticity and melt strength.

26. (Previously Presented) Thermoplastic vulcanizates according to claim 24, wherein the matrix consists of semi-crystalline polymers or amorphous polymers.
27. (Previously Presented) Thermoplastic vulcanizates according to claim 26, wherein the semi-crystalline polymers are chosen in the group consisting of thermoplastic polyesters, polyacetals, polyvinylidene fluoride (PVDF), polycarbonate, polystyrene and styrene copolymers, crystalline polyethylene, ethylene copolymers, polypropylene homopolymer, propylene-ethylene random copolymer, heterophasic propylene-ethylene copolymer and polyamides.
28. (Previously Presented) Thermoplastic vulcanizates according to claim 24, wherein the content of matrix is 15 to 80 wt% of the total vulcanizate.
29. (Previously Presented) Thermoplastic vulcanizates according to claim 24, wherein the cross-linked disperse phase is chosen from the group consisting of polyethylene having density in the range  $0.90 - 0.96 \text{ g/cm}^3$ , ethylene-alpha-olefin copolymers having density in the range  $0.85 - 0.95 \text{ g/cm}^3$ , ethylene copolymers with vinyl acetate or acrylate or other polar monomers; chlorinated polyethylene, styrene block copolymers, natural rubber, polybutadiene, nitrile rubber, butadiene-styrene rubber, chloroprene rubbers, butyl rubber, hydrogenated rubbers, and blends thereof.
30. (Previously Presented) Thermoplastic vulcanizates according to claim 24, wherein the content of the disperse phase is 20 to 85 wt% of the total vulcanizate.
31. (Previously Presented) Thermoplastic vulcanizates according to claim 24, wherein the thermoplastic vulcanizates are formed into products by processing techniques selected from the group consisting of extrusion, injection molding, thermiforming, blow molding and calendering.
32. (Canceled)

33. (Previously Presented) Process according to claim 1, wherein said disperse phase component comprises more than 95% gel content.
34. (Previously Presented) Thermoplastic vulcanizates according to claim 25, wherein the matrix consists of semi-crystalline polymers or amorphous polymers.
35. (Previously Presented) Thermoplastic vulcanizates according to claim 34, wherein the semi-crystalline polymers are chosen in the group consisting of thermoplastic polyesters, polyacetals, polyvinylidene fluoride (PVDF), polycarbonate, polystyrene and styrene copolymers, crystalline polyethylene, ethylene copolymers, polypropylene homopolymer, propylene-ethylene random copolymer, heterophasic propylene-ethylene copolymer and polyamides.
36. (Previously Presented) Thermoplastic vulcanizates according to claim 25, wherein the content of matrix is 15 to 80 wt% of the total vulcanizate.
37. (Previously Presented) Thermoplastic vulcanizates according to claim 25, wherein the cross-linked disperse phase is chosen from the group consisting of polyethylene having density in the range  $0.90 - 0.96 \text{ g/cm}^3$ , ethylene- $\alpha$ -olefin copolymers having density in the range  $0.85 - 0.95 \text{ g/cm}^3$ , ethylene copolymers with vinyl acetate or acrylate or other polar monomers; chlorinated polyethylene, styrene block copolymers, natural rubber, polybutadiene, nitrile rubber, butadiene-styrene rubber, chloroprene rubbers, butyl rubber, hydrogenated rubbers, and blends thereof.
38. (Previously Presented) Thermoplastic vulcanizates according to claim 25, wherein the content of the disperse phase is 20 to 85 wt% of the total vulcanizate.
39. (Previously Presented) Thermoplastic vulcanizates according to claim 25, wherein the thermoplastic vulcanates are formed into products by

processing techniques selected from the group consisting of extrusion, injection molding, thermiforming, blow molding and calendering.

40. (Previously Presented) Thermoplastic vulcanizates according to claim 25 wherein the high gel content of the vulcanized disperse phase component is greater than 95%.
41. (Previously Presented) Thermoplastic vulcanizates according to claim 24 wherein the high gel content of the vulcanized disperse phase component is greater than 95%.